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Edge currents in multiband chiral p-wave superconductors[1] WEN HUANG, McMaster University, CATHERINE KALLIN, McMaster University and Canadian Institute for Advanced Research, EDWARD TAYLOR, McMaster University — The superconducting phase of Sr_2RuO_4 is believed to be a time-reversal symmetry breaking state with spontaneous supercurrents at the edge or domain walls of the sample. Yet Scanning SQUID and related probes have so far failed to detect any signature of such edge currents. Recent theoretical work suggests that the active superconducting bands in Sr_2RuO_4 are the two quasi-1D bands associated primarily with the d_{xz} and d_{yz} orbitals of Ru^{4+}. This contrasts with the more conventional picture in which chiral p-wave superconductivity is primarily a single-band effect, with the γ band being the active superconducting band. Based on Bogoliubov-de-Gennes calculations for tight-binding models, we study the implications of two-band chiral p-wave order on the edge current. The two-band model includes inter-orbital hopping and spin-orbit coupling. In general, the two-band model predicts a net edge current that is at least about an order of magnitude smaller than that from the one-band model. In particular, comparable magnitudes of inter-orbital hopping and spin-orbit coupling lead to substantial reduction of edge current. Also presented are finite temperature calcuations involving all three bands.

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